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OF THE

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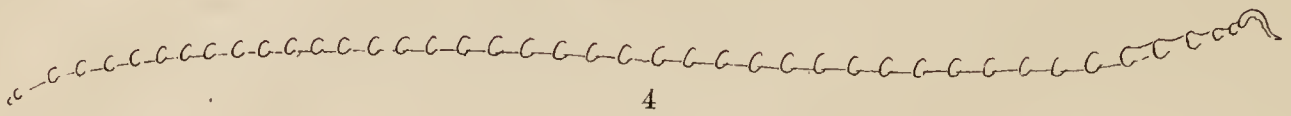

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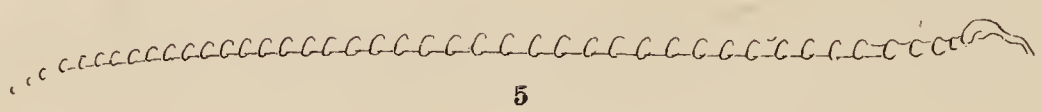

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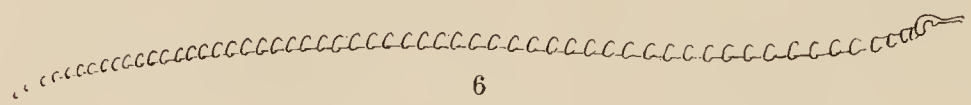

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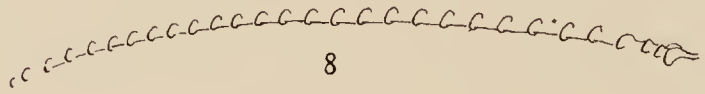

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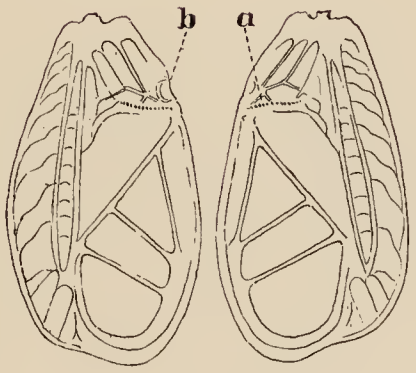

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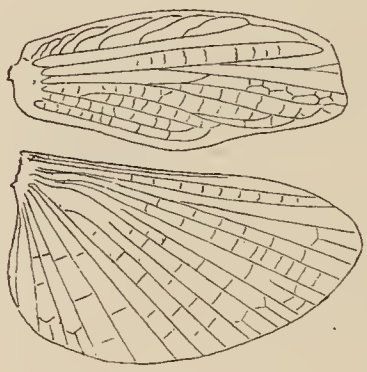

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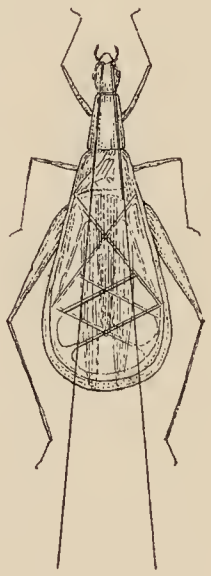

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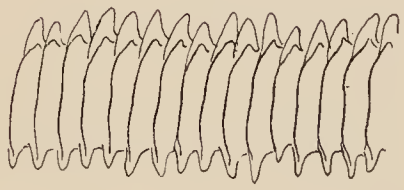

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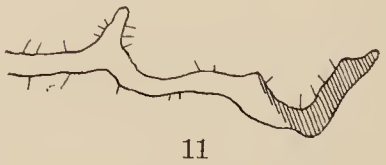

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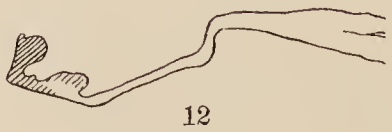

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RASPS OF ŒCANTHUS.

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VOL. XIII. JANUARY, 1897. No. 1.

STRUCTURE OF THE MUSICAL RASPS OF TREE CRICKETS (*ŒCANTHUS*).

BY REV. J. L. ZABRISKIE.

(*Presented November 20, 1896.*)

Wing-cover rasps, as shrilling organs, are found among our Orthoptera in the families Gryllidæ, comprising our Black Crickets and Tree Crickets, and Locustidæ, comprising our Katydids and Green Grasshoppers, with the exception of some wingless genera in each family. The apparatus is a specialization of the wing-covers of the male, and is mainly used for alluring the female. It consists of a rasp on the under surface of each wing-cover rubbed over a scraper on the posterior edge of the opposing wing-cover.

Description of Plate 62.

FIG. 1.—*Œcanthus niveus* (De Geer), ♂ × 1½.

FIG. 2.—*Œcanthus 4-punctatus* Beutenmüller, ♀. Wings of the right side. × 2.

FIG. 3.—Ditto, ♂. Right and left wing-covers. a, right rasp; b, left scraper. × 2.

FIG. 4.—*Œcanthus niveus*, ♂. Right rasp. × 50.

FIG. 5.—*Œcanthus latipennis* Riley, ♂. Right rasp. × 50.

FIG. 6.—*Œcanthus 4-punctatus*, ♂. Right rasp. × 50.

FIG. 7.—*Œcanthus nigricornis* Walker, ♂. Right rasp. × 50.

FIG. 8.—*Œcanthus angustipennis* Fitch, ♂. Right rasp. × 50.

FIG. 9.—Central teeth of the right rasp of *Œcanthus 4-punctatus*, ♂. × 300.

FIG. 10.—Longitudinal section of ditto. × 300.

FIG. 11.—Transverse section of the left scraper of ditto. Densely chitinized portion shaded. × 250.

FIG. 12. Transverse section of the right scraper of *Conocephalus robustus* Scudder, ♂. × 50.

FIG. 13.—Central teeth of the right rasp of *Gryllus abbreviatus* Serville, ♂. × 300.

FIG. 14.—Central teeth of the right rasp of *Nemobius fasciatus*, from *vittatus* (Harris), ♂. × 300.

The shrilling of the Orthoptera is, probably, one of the most remarkable instances in all nature of a great volume of sound produced by a minute, delicate and purely mechanical instrument. It seems incredible that so much noise can be produced by such an apparently insignificant machine. It is said that our genuine Katydid, under favorable circumstances, can be heard for the distance of one-half mile. All, who have passed through the experience, will remember the terrible din occasioned by one of our trains of open steam cars on the journey to Coney Island, making it almost impossible to hold any verbal communication with even one's nearest neighbor. Perhaps there are also those who will remember that in the late summer and autumn, as the train passes the salt marshes, there are creatures which sing in the sedge, whose combined song distinctly fills the ear above all din of the train when under full headway. This is mainly the song of one of our Green Grasshoppers, *Conocephalus robustus*. The song of our Black Crickets has been praised in poetry, and is often admired by people of plain prose; but to a victim of insomnia it sometimes becomes an intolerable nuisance. And while the rasp of *Œcanthus*, probably, is the most attenuated, delicate rasp in the insect world, one, who has attempted to locate by sound a single individual in the heat of the day, has found that sound of extremely high pitch, and of remarkable carrying and penetrating power.

In both families—Locustidæ and Gryllidæ—the male wing-covers are so different in form from those of the female that the sexes can usually be distinguished at a glance. But in the Gryllidæ, and especially in *Œcanthus*, this difference is most striking. In the male Katydids and Green Grasshoppers the difference consists mainly in the plain indication of the position of the rasp, and sometimes in a mica-like transformation of the surrounding tissues. In the Black Crickets the venation of the female wing-covers is of such a nature as to tend to divide the whole surface into a series of small lozenges, while the wing-covers of the male plainly indicate the rasp, and also have prominent veins running in an irregular constant pattern. In *Œcanthus* both sexes have the hinder

wings quite similar, and, when at rest, folded on the dorsum in a straight bundle precisely like a folded fan, as is usual in the entire suborder, giving occasion for the name, Orthoptera. Both sexes also have the outer, anterior portion of the wing-covers throughout their entire length bent downward in repose, partly enveloping the abdomen on either side. But the female wing-covers are narrow above with inconspicuous venation, while the male wing-covers are much wider and flatter above, furnished with a prominent and striking venation, and are usually transparant and micaceous throughout. (Figs. 2, 3.)

In all these rasp-bearing species the rasp is always situated on the under surface of the wing-cover, and is composed of a pretty definite number of nearly semicircular teeth seated upon a stout specialized vein. The rasp-bearing portion of this vein lies nearly transverse to the long diameter, well toward the anal angle, and always extends nearly to the inner, posterior margin of the wing-cover. (Fig. 3, a.) The wing-covers of *Œcanthus* and *Gryllus* are so short, in comparison with the examples of Locustidæ, that the rasp is situated at nearly one-third of the length of the wing-cover from the articulation of the latter with the body. In the Katydids and Green Grasshoppers the rasp lies comparatively near the articulation.

The scraper is a slight upturned thickening of the inner posterior margin of each wing-cover respectively, just anterior to each rasp, forming the posterior margin of a structure, which in its boundaries very much resembles the form of the outer human ear. The acting edge of the scraper lies transverse to the length of the entire rasp, and parallel with the edges of the teeth, and hence in the best position to produce vibration. (Fig. 3, b.)

Attention is called to the admirable manner in which the rasps of *Œcanthus* are braced and supported by the prominent diagonal veins of the male wing-cover. (Fig. 3.) In repose the wing-covers so overlap that these diagonal veins bisect each other, and, on account of the transparency of the structure, afford quite elegant patterns. (Fig 1.)

In action the wing-covers are slightly elevated above the body, and slightly expanded as respects each other, and the articulations of the wings are so situated that under the circumstances one rasp lies directly over its corresponding scraper. Then lateral movement of both wing-covers, so rapid as to cause a tremulous hazy appearance at the margins, sets the whole apparatus in vibration and gives rise to the shrilling call.

As noted before, the teeth of the rasp always project downward from the under side of the wing-cover, and are so situated upon the supporting vein that their sharp free edges incline at an angle of about 45° towards the inner posterior margin of the wing-cover. A longitudinal section of the rasp gives the sectional outline of these teeth the projecting raking form of those of a carpenter's ripsaw. (Fig. 10.) The thickened edge of each scraper rises slightly towards the upper surface, and hence is perfectly adapted to engage with the teeth of the rasp above it. (Fig. 11.)

When the microscope is focused upon the upturned sharp edge of these rasping teeth it will be seen that the edge in *Gryllus* and *Nemobius* is compound and complicated at either lateral extremity (Figs. 13, 14); but the teeth of *Œcanthus* are more simple, like stout semicircular fish-scales, seated upon the supporting vein, only having the curved projecting portion of each tooth plainly crenated and furrowed. (Fig. 9.)

Not only are the male wing-covers specialized beyond those of the female, but also the wing-covers of each male are specialized as regards the alternate sides. This is indicated by the fact as to which wing-cover is, in repose, habitually carried uppermost. In the Locustidæ (Katydids and Green Grasshoppers) the male left wing-cover is habitually above when at rest, and the left rasp is by far larger and stronger than the right. In the Gryllidæ (*Gryllus*, *Nemobius* and *Œcanthus*) the males always die in the cyanide bottle with the right wing-cover uppermost. And while the right rasp does not appear to be more developed than the left (the right rasp in fact having a few less teeth than the left), yet the left scraper, which

engages with the right rasp, is always more prominent and more developed than the right.

The following table gives a comparison of the rasps of certain species of Gryllidæ. The number of teeth to the mm. is reckoned from the outer anterior end of the rasp, in which portion the teeth are usually larger and more developed than they are towards the posterior end:

	TOTAL LENGTH.		TOTAL NUMBER OF TEETH.		NUMBER OF TEETH TO 1 MM.	
	Right rasp.	Left rasp.	Right rasp.	Left rasp.	Right rasp.	Left rasp.
Œcanthus nivens.....	1.90 mm.	1.95 mm.	42	44	20	21
" *latipennis* ...	1.44 "	1.59 "	42	45	26	25
" *4-punctatus*..	1.41 "	1.48 "	56	59	35	36
" *nigricornis*..	1.24 "	1.44 "	45	48	33	30
" *angustipennis*	1.0 "	1.1 "	28	29	28	26
Gryllus pennsylvanicus.	3.3 "	3.23 "	172	166	44	44
Nemobius fasciatus, form *vittatus*.....	1.54 "	1.3 "	220	170	122	114

A NEW MARINE FOSSIL DIATOMACEOUS DEPOSIT IN ALABAMA.

BY K. M. CUNNINGHAM.

(*Read February 5th, 1897.*)

An ample specimen of a marine diatomaceous deposit, which I discovered in the month of June, 1896, donated herewith for distribution among the members of the Society, will meet various points of interesting study, viz.: the association of the contained species; the relation to the already known deposits of California (Pacific coast) and of Richmond (Atlantic coast); the mineralogical character of the deposit; its geological affinity as to age with that of other American deposits; and finally the opportunity of discovering some undescribed species of North American diatoms.

It is customary, when a diatomist or micro-geologist discovers a new and interesting find, to locate the deposit, so that the station may be readily identified in the future by any one who may have sufficient interest to visit the same. To show the application of this statement I may be excused for referring to a case in question. About the year 1850, Prof. J. W. Bailey recorded the notice of the occurrence of an indurated clay, in which he had found indications of a few species of marine fossil diatoms. He described the station as the site of an old ferry crossing on Hillsboro Bay in the vicinity of Tampa, Florida. After a period of about forty years, the U. S. Geological Survey, during two years of desultory search by parties sent for the purpose of re-locating the clay stratum referred to, failed to find the station. This result is announced in the U. S. Geological Report, entitled "Correlation of the Neocene," issued about the year 1894.

It was my lot to first determine that the phosphate deposits were associated with a marine infusorial stratum. Before I had ever seen the Report on the "Correlation of the Neocene" I had already placed on record with this Society selected slides and specimens of the marine diatomaceous clay associated with

the phosphate area of Florida. At the same time I sent samples of the clay to Mr. Lewis Woolman, of the Pennsylvania Geological Survey, who had been following data to establish the truth of the hypothesis of the probable extension of the Atlantic coast "great miocene diatomaceous bed" to the area bordering on the Gulf of Mexico. It was through him that I was enabled to state in the Journal of this Society that I had succeeded in demonstrating what the U. S. Geological Survey had failed to determine in a two years' search in the neighborhood of Bailey's work. However, it so happens that neither the Florida fossil diatomaceous stratum nor the Suggsville stratum help him to perfectly establish the theory. The Suggsville deposit, so far as known, is of eocene age, and the associated species do not match in either case with the great 300-feet bed of the Atlantic coast.

The discovery of the Suggsville deposit occurred while I was on an extended journey, in June, 1896, for the purpose of collecting characteristic mineral specimens to be exhibited at a proposed Southern States Exposition to he held at Chicago. Suggsville, Clarke County, Alabama, was of interest because its strata had yielded the celebrated vertebral bones of *Zeuglodon Harlanii* and its chalk rocks had yielded *Orbitoides Mantelii*. The town is distant two miles east from a station of the same name on the Mobile and Birmingham Railroad. At the time of my visit failure in hiring a public conveyance at the station compelled me to walk to the town, and gave me ample opportunity to study the various formations met in transit. At a point about midway between station and town, on the right hand in going east, my attention was attracted to a very high bluff, at whose base flowed a very shallow, pebbly stream. I also noted a smooth-faced stratum of yellowish gray stratified clay about fifteen feet in height, from the base of which I secured a small test specimen. This stratum of clay was covered by an additional stratum of chalk, of some fifty feet in thickness, surmounted by the usual forest growth. The locality can be easily identified by any visitor.

I collected a few more detached and water-worn pieces of

the hard material at various points along the stream, which always closely accompanied the public road, and supposing they were merely specimens of the chalky strata abundant here over an extended area, they were neglected for a period of seven months. In December last, while arranging in a cabinet the minerals collected in the preceding June, the sight of these Suggsville specimens reminded me that I had never closely examined them. The first attempt at analysis showed that I had located a remarkable marine fossil diatomaceous deposit hitherto unknown. Being unable to return to the locality, through the kindness of Dr. C. I. Dahlberg, residing in the vicinity, and following my written directions, I obtained a supply of about fifty pounds of the same material. As Dr. Dahlberg may be for many years a living witness as to the situation of this inexhaustible bed of tripoli, I introduce his name, hoping that the reference may be useful to some one—geologist, diatomist or micrographer—who in the future may desire some further information respecting the site of the deposit.

The Geological Map of the State of Alabama and the Coastal Plain Report of Alabama for 1895 indicate the formation around Suggsville as a subdivision of the eocene tertiary, known as the buhrstone. And the miocene tertiary, including the fossil marine diatomaceous deposits of the Pacific coast, as at Monterey and Santa Monica, and of the Atlantic coast, as at Nottingham, Md., Richmond and Petersburg, Va., and Atlantic City, N. J., and as far south as Charleston, South Carolina, is referred to the true miocene. But the miocene area in Alabama, bordering on the Gulf of Mexico at Biloxi, Miss., and underlying the site of Mobile at a depth of 600 feet, cannot be studied superficially, because the La Fayette mantle covers a very extensive area, the miocene not appearing on the surface excepting in Mississippi, about thirty miles to the west of Mobile. The diatoms in these clays are also mineralized as pyrites, and are much smaller in size and of fewer species than those occurring in the miocene of the Atlantic coast.

My examinations of small specimens of this Suggsville de-

posit disclose species of many genera of diatoms. A more extended examination will, doubtless, be rewarded with the recognition of additional genera, and, perhaps, with the discovery of some new species. The following have been noted: *Amphora ; Amphiprora ; Auliscus ; Aulacodiscus ; Actinocyclus; Actinoptychus ; Asterolampra ; Amphitetras ; Biddulphia ; Coscinodiscus ; Cocconeis ; Cyclotella ; Corinna ; Diatoma ; Dimeregramma ; Eunotogramma ; Glyphodiscus ; Hyalodiscus ; Melosira ; Hemiaulus ; Navicula ; Pleurosigma ; Pyxilla ; Rutilaria; Raphoneis ; Triceratium ; Trinacria ;* many species of Foraminifera; several species of Radiolarians; Sponge spicules; Gorgonia spicules; stellate spicules; crystals of Selenite; matted crytalline plates; and occasional Zanthidium bodies. The above list of genera of diatoms in this deposit shows a closer agreement with the Pacific coast genera than with those of Richmond, Va., as may be seen by comparing Wolle's "Diatomaceæ."

In this material the forms of *Biddulphia* and *Actinocyclus* are defaced by being packed with rhomboidal crystals; most of the diatoms have been altered to a glass-like transparency; *Aulacodiscus* and *Glyphodiscus* have both valves intact, their nodular processes of the lower valve repeating themselves by bisecting the bosses of the upper valve while focusing downwards; square or flat Navicular forms have become somewhat cylindrical; the Coscinodiscoidal forms range in size from $\frac{1}{50}$ to $\frac{1}{500}$ inch in diameter; several species show incomplete fission of individuals, one half of the sphere being perfect in structure, with the other half still enclosed in the sporangial sheath; and *Melosira* will be found in spiral coils, the discs showing minute forms of *Raphoneis* dotting the surfaces. A probably new form of *Pyxilla* is quite common, having a slight resemblance to *Rhizosolenia*, such a form not being indicated in Wolle's "Diatomaceæ."

In cleaning the material the clay softens readily in water; effervesces very strongly in nitric or hydrochloric acids; and but slowly in sulphuric acid. The former two acids are incapable of dissolving the internal matter of the Foraminifera, thus leaving the preparations filled with casts of the chambers

and minute foraminiferal channels. It seems that a mixture of nitric and sulphuric acids slowly dissolves the plexus of crystals filling the forms of *Biddulphia* and *Actinocyclus*, but to accomplish this requires lengthy digesting in the acids. The amorphous clay particles, which interfere with the concentration of the diatoms, may be eliminated by trituration on a piece of rubber cloth or sheepskin. The diatoms can be removed from the sand by gentle twirling in a watch crystal. On the inclination of the crystal the diatoms will flow away from the sand and may be secured with a pipette. One ounce of the material should supply at least fifty slides.

PHOSPHORESCENCE AND OZONE.—Recent investigations on the part of M. Otto, relative to the properties of ozone, point to the conclusion that the presence of organic matter in water, whether animal or vegetable, is responsibe for the luminosity produced when that substance is brought into contact with ozone. Most organic substances are, according to M. Otto, calculated to offer the phenomenon of phosphorescence, if ozone be present.—*National Druggist.*

THE SECRET OF THE BROWNIAN MOVEMENT.—Mr. R. Meade Bache gives an account of the experiments which he has made in order to determine the cause of the Brownian movements. Robert Brown found as the result of a series of experiments which he made on finely crushed glass, various minerals and many organic substances, that extremely minute particles of solid matter, whether organic or inorganic, when suspended in water, exhibited motions resembling in their irregularity the less rapid motions of some of the simplest animalcules of infusions, and states his belief that the motions "neither arose from currents in the fluid containing them, nor depended on the intestine motion which may be supposed to accompany its evaporation." More recently Herren Wiener, Exner, and Schultze have investigated these movements. Wiener concluded from his experiments that they have for their basis the movements which, by virtue of their molecular constitution, belong to fluids. Exner considered that the liveliness of the movement was heightened by light and heat.

The author, in his experiments, made use of finely divided carmine suspended in water. He found that no effect was produced upon the movement by the passage of a galvanic current through the liquid, by placing the liquid in the lines of force of a permanent magnet, nor by the application of heat and cold. Herr Wiener had been inclined to attribute the movement to the action of the red wave of light, but the author could detect no alteration in the movements when either a violet or a red glass was interposed between the source of light and the particles.

By observation for weeks, both with water-immersion lenses and also with a $\frac{1}{15}$ dry lens, of liquid enclosed in a hermetically sealed cell the author could find no alteration in the movement, and concludes that evaporation has nothing to do with it. As the result of all his experiments the author therefore concludes "that it is not the particles which are moved by their own energy, or moved by any energy directly imparted to them from outside sources, but that it is the fluid that moves them."

According to the author, in alcohol and in fixed and volatile oils the Brownian movement is not observable; it is a property of water and of water alone, and is caused by the mutual repulsion of the molecules of this liquid.

Journ. Roy. Mic. Soc., from Proc. Amer. Phil. Soc., xxxiii (1894), pp. 163–77.

Preservation of Anatomical Specimens in their Natural Color.—The following formula was presented by Dr. Kaiserling in the *Deutsche Medicinische Wochenschrift* (1896):

The material is first hardened for twenty-four to forty-eight hours, according to size, nature, etc., in the following solution:

Formaldehyde (officinal solution) . .	25 parts.
Potassium nitrate	1 part.
Potassium acetate	3 parts.
Water	100 parts.

From this solution the material is removed to alcohol of 95°, where it is left from six to twenty-four hours, as before,

according to nature, etc. It is then transferred to a solution consisting of from 1 to 6 parts of potassium acetate in a mixture of from 2 to 6 parts of glycerine and 10 parts of water. The more delicate and transparent a tissue or organ in its fresh condition the more glycerine and the less potassium acetate are required. According to circumstances the materials remain in this preparation from one to two days, and they are then finally transferred to a mixture of equal parts of water and glycerine, to which one-tenth of its *weight* of absolute alcohol is added. It is claimed by the author that anatomical material thus prepared may be kept for years, preserving its natural appearance to the last.

Another method is that suggested by Tores in *Therapie der Gegenwart*, as follows:

First harden, by immersing for a greater or less period of time, according to the nature of the material, its volume, etc., but no longer than twenty-four hours, at the outside, in a solution consisting of:

Formaldehyde (officinal solution) . .	2–10 parts.
Common salt	1 part.
Magnesium sulphate	2 parts.
Sodium sulphate	2 parts.
Water	100 parts.

After hardening in this material (which bleaches the preparation), pour off the liquid and replace it with 95° alcohol. The color begins to return in a short time, and after a few hours the specimen resumes nearly its natural appearance. When however the alcohol is, after a few days, replaced by a mixture of glycerine and water, with the addition of a tenth part of alcohol, the specimens assume a perfectly fresh appearance, which Tores declares will persist for months and years.—*National Druggist.*

Hope Embalmed.

By Mrs. I. McC. Wilson.

Encased within the amber's hold,
As though in pale transparent gold,
A hapless insect died,
Beating from pearly wings the scales,
Whose cloud-like stream behind it trails,
Caught by the solid tide.

So, too, a hope once soared elate,
And, met by overwhelming fate,
Died, struggling with despair:
And memory, when ceased its pain,—
With vain regrets in dusky train,—
Embalmed it changeless there.

New York, February 5th, 1897.

PROCEEDINGS.

Meeting of October 2d, 1896.

The President, Dr. Edw. G. Love, in the chair.

Twenty persons present.

Mr. Horatio W. Fraser and Dr. Albert S. Newcomb were elected resident members of the Society.

OBJECTS EXHIBITED.

1. Fruit of *Danthonia spicata* Beauv., Wild Oat Grass, showing the awn of the flowering glume flattened and spirally twisted at its base: by J. L. Zabriskie.

2. Photographic time shutter for use in photomicrography: by Frank D. Skeel.

3. Transverse section of stem of *Canna*, by dark ground illumination: by J. D. Hyatt.

4. Transverse sections of hair of Peccary: by J. D. Hyatt.

5. Pond-life, from Morris and Essex Canal, N. J.: by Stephen Helm.

Dr. Skeel explained the operation of his exhibit—a Packard shutter with an opening eight inches diameter, surmounted by a stop clock; the whole apparatus (in order to overcome undue vibration) suspended in proper position before the camera; shutter and clock actuated pneumatically by one rubber bulb, attached to rubber tubing of any convenient length; pressure on the bulb projecting a piston which opens the shutter, and at the same instant projecting another piston which stops the stop-hand of the clock; relaxation of the bulb, by suction, withdrawing both pistons, thus closing the shutter and releasing the clock hand.

Mr. Hyatt explained that his excellent dark ground illumination was obtained by a substage condenser of three lenses, of his own arrangement, fully illuminating the object, while avoiding the illumination of the glass slip.

Meeting of October 16th, 1896.

The President, Dr. Edw. G. Love, in the chair.

Nineteen persons present.

Dr. Horatio W. Fraser donated to the Library of the Society an old microscopical work, entitled "Employment for the Microscope, by Henry Baker. London, 1764."

The thanks of the Society were tendered Dr. Fraser for this donation.

OBJECTS EXHIBITED.

Sagittal sections of Dragon-flies, Odonata: by L. Riederer:

1. Abdomen of *Calopteryx maculata*, ♂.
2. Do. of *C. apicalis*, ♀, digestive tract and contents.
3. Do. of *Diplax vicina*, ♀, showing Malpighian vessels.
4. Do. stomach contents and ovary.
5. Native crystallized copper, from Venezuela: by Frederick Kato.
6. Green garnet, Uvarovite, from Orford, Canada: by Frederick Kato.
7. Rotifer, *Apoecia amelia*, living, from New Jersey: by Frederick Kato.
8. Eye of Cockroach, showing multiple images: by J. D. Hyatt.
9. Eye of *Gyrinus*, with multiple images: by J. D. Hyatt.
10. *Stephanoceros Eichornii*, from Central Park, New York: by Stephen Helm.
11. *Œcistes longicornis*: by Stephen Helm.
12. *Carchesium polypinum*: by Stephen Helm.
13. *Pectenella magnifica*: by W. J. Lloyd.
14. Aragonite on serpentine, from Hoboken, N. J.: by James Walker.
15. Spines of Heart-shaped Echinus, *Echinocardium australe*: by Edw. G. Love.
16. A recent Crinoid, preserved in alcohol, collected by the Peary Relief Expedition at McCormic's Bay, Greenland: by Edw. G. Love.

Mr. Walker said of Mr. Kato's rotifer that it is mentioned only in Trans. Acad. Sci. of Philadelphia, and is the same as

Mr. A. D. Balen's rotifer of "pond 61," two and one-half miles from Westfield, N. J.

To questions on preparation of insect eyes for showing multiple images, Mr. Hyatt replied, "While the eye of dragon-flies is pretty good for the purpose, and the eye of beetles very good, nothing is better than the eye of the cock-roach. On account of the refractive index do not mount in balsam, but rather in glycerine or glycerine jelly.

Dr. Love stated with regard to his exhibit of the crinoid, that this species is at first free swimming, then stalked, and finally free again. The West Indian species is the only living species stalked when adult.

Meeting of November 6th, 1896.

The Vice-President, Dr. Frank D. Skeel, in the chair.

Thirty-four persons present.

Dr. Herbert Neher and Mr. D. D. Flemming were elected resident members of the Society.

Dr. Alexis A. Julien addressed the Society on "Microscopy: its true Place in the Scheme of Education." This address was illustrated by a series of lantern slides, and is published in the Journal, Vol. XII., p. 93.

Meeting of November 20th, 1896.

The President, Dr. Edw. G. Love, in the chair.

Thirty-two persons present.

The following persons were appointed Committee on Annual Exhibition: George W. Kosmak, Thomas S. Nedham, Stephen Helm.

The following persons were appointed Committee on Nominations of Officers: Charles F. Cox, P. H. Dudley, J. D. Hyatt.

Mr. William Beutenmüller read a paper entitled "Songs and Habits of the North American Tree Crickets." This paper was illustrated by black-board drawings, and many related entomological specimens.

Rev. J. L. Zabriskie addressed the Society on "Structure of the Musical Rasp of the Tree Crickets (*Œcanthus*)." This address was illustrated by black-board drawings and microscopical preparations noted below, and is published in this number of the JOURNAL, p. 1.

OBJECTS EXHIBITED.

1. *Œcanthus 4-punctatus*, Beut., ♀. Left wing cover.
2. *Œcanthus 4-punctatus*, Beut., ♂. Right wing cover.
3. *Œcanthus 4-punctatus*, Beut., ♂. Left wing cover.
4. *Œcanthus 4-punctatus*, Beut., ♂. Longitudinal section of rasp.
5. *Nemobius vittatus* Harris, ♀. Longitudinal section of rasp.

All by J. L. ZABRISKIE.

MEETING OF DECEMBER 4TH, 1896.

The President, Dr. Edw. G. Love, in the chair.

Sixteen persons present.

OBJECTS EXHIBITED.

1. Sections of the head of the beetle, *Cyllene pictus* Drury, showing structure of the eye, optic nerve, etc.: by L. RIEDERER.
2. Transverse section of cornea and crystalline cones of eye of do.: by L. RIEDERER.
3. Transverse section of entire eye of *Vanessa Io*: by L. RIEDERER.
4. Separated crystalline cones of eye of do.: by L. RIEDERER.
5. Four photomicrographs of sections of insect eyes by Mr. Riederer: by EDW. G. LOVE.
6. Spicules of Sponge: by EDW. G. LOVE.
7. Spicules of Sea Urchin: by EDW. G. LOVE.
8. Fish parasite, *Pandarus*, from dorsal fin of Dog fish: by EDW. G. LOVE.
9. Photomicrographs of two immature forms of *Pandarus*: by EDW. G. LOVE.

10. Mole flea: by J. D. HYATT.
11. Hair of common Mole: by J. D. HYATT.
12. Section of eye of *Limulus*: by J. D. HYATT.
12. Spiracles and tracheæ of *Belostoma*: by F. W. LEGGETT.

Mr. Riederer gave an extended explanation of the structure of the arthropod eye.

MEETING OF DECEMBER 18TH, 1896.

The President, Dr. Edw. G. Love, in the chair.

Thirteen persons present.

Mr. Charles F. Cox, Chairman of the Committee on Nominations of Officers, reported the following nominations for the year 1897: For President, Dr. Frank D. Skeel; Vice-President, George W. Kosmak; Treasurer, James Walker; Librarian, L. Riederer; Recording Secretary, George E. Ashby; Corresponding Secretary, Rev. J. L. Zabriskie.

OBJECTS EXHIBITED.

1. Head of Blow Fly: by GEORGE W. BLAKESLEE.
2. Spiracles of larva of Hawkmoth: by F. W. LEGGETT.
3. Tendril suckers of German Ivy: by F. W. LEGGETT.
4. Eye of Telescope Fish: by F. W. LEGGETT.
5. Foot of the Butterfly, *Argynnis*, showing pulvillus: by EDW. G. LOVE.
6. Transverse section of spine of *Echinus diadema*: by EDW. G. LOVE.
7. Crystals of Cobalto-cyanide of Potassium: by EDW. G. LOVE.
8. Hypopygium of the Fly, *Dolicopus*: by EDW. G. LOVE.

Mr. Blakeslee explained that his head of Blow Fly, which was a very fine preparation, with the proboscis beautifully expanded, was mounted in pure balsam, without pressure, in a xylonite cell cemented to the glass slip with gold size, the cement being allowed to dry three months before the mounting of the preparation.

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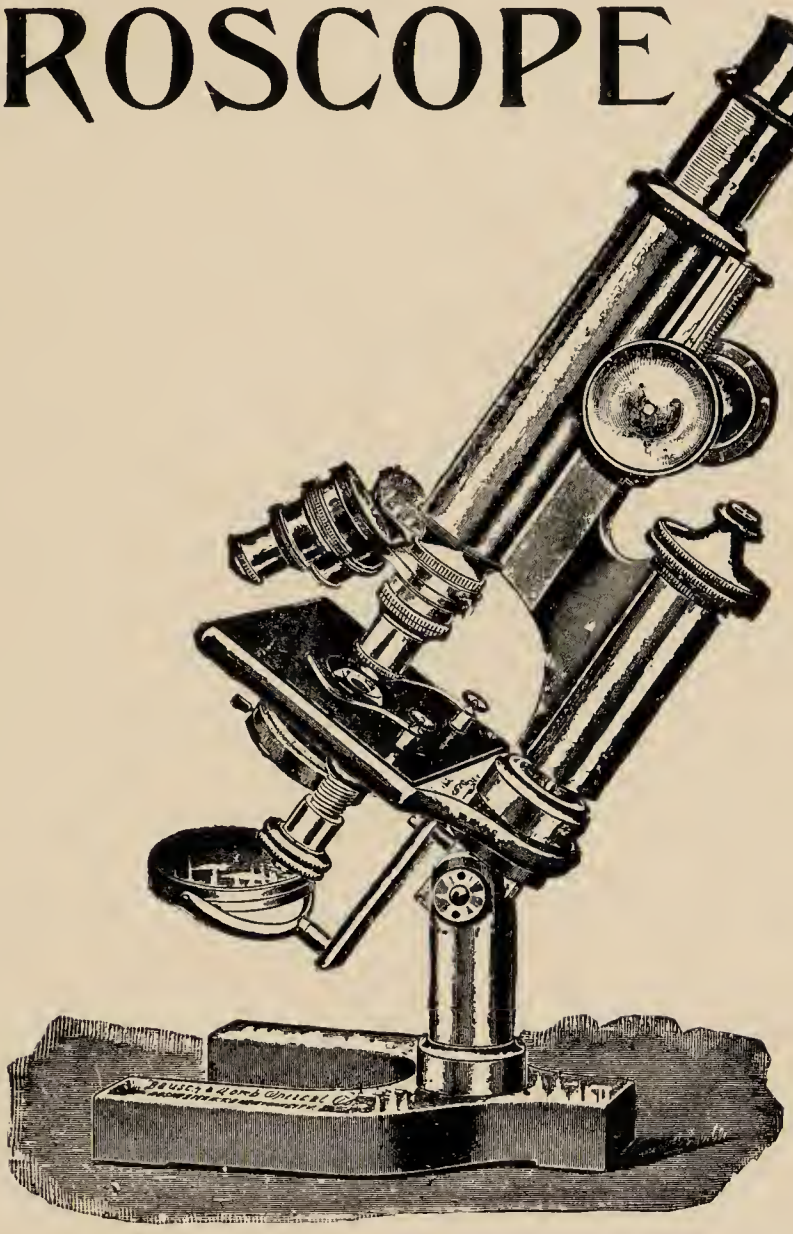

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